What is claimed is:

1. A composition comprising an apo-carbonic anhydrase protein and a photoluminescent molecule selected from the group consisting of dansyl aziridine, 4-chloro-7-sulfobenzofuracan, 7-fluorobenz-2-oxa-1,3-diazole-4-sulfonamide and 4-nitrobenzoxadiazol-7-chloride, or a composition comprising the reaction product of an apo-carbonic anhydrase protein and a photoluminescent molecule selected from the group consisting of dansyl aziridine, 4-chloro-7-sulfobenzofuranan, 7-fluorobenz-2-oxa-1,3-diazole-4-sulfonamide and 4-nitrobenzoxadiazol-7-chloride.

2. A composition comprising an apo-carbonic anhydrase protein and a photoluminsecent molecule selected from the group consisting of 7-fluorobenz-2-oxa-1,3-diazole-4-sulfonamide:B-mercaptoethanol adduct, dansylamide, hydroxynaphthalenesulphonamide, 2-(3-methoxy-4-ethoxyphenyl)-4-chloroquinoline-6-sulfonamide, N-(1-anthracenyl)-4-sulfonamide-benzenesulfonamide, ethyl-2-(4-sulfonamidophenyl)-4-hydroxyquinoline-6-carboxylate and N-(N'-(4'-sulfamoylglutaranily-amidoethyl))-4-amino-3,6-disulfo-1,8-naphthalimide.

3. The composition of claim 1, wherein the photoluminescent molecule is conjugated to the apo-carbonic anhydrase protein.

4. The composition of claim 1, wherein the apo-carbonic anhydrase protein is a human apo-carbonic anhydrase.

5. The composition of claim 2, wherein the apo-carbonic anhydrase protein is a human apo-carbonic anhydrase.

6. The composition of claim 1, wherein the apo-carbonic anhydrase protein is a human carbonic anhydrase II isozyme or a variant thereof having a cysteine replacement of one amino acid.

7. The composition of claim 1, wherein the apo-carbonic anhydrase is one selected from the group consisting of carbonic anhydrase II (L198C), carbonic anhydrase II (V143C), carbonic anhydrase II (H64C).

8. The composition of claim 5, wherein the photoluminescent molecule is conjugated to the apo-carbonic anhydrase through the cysteine replacement amino acid.

9. The composition of claim 6, wherein the photoluminescent molecule is conjugated to the apo-carbonic anhydrase through the cysteine replacement amino acid.

10. The composition of claim 7, wherein carbonic anhydrase II (V143C) is conjugated to dansyl aziridine.

11. The composition of claim 7, wherein carbonic anhydrase II (L198C) is conjugated to 4-chloro-7-sulfobenzofurazan.

12. The composition of claim 7, wherein carbonic anhydrase II (H64C) is conjugated to 7-flurobenz-2-oxa-1,3-diazole-4-sulfonamide.

13. The composition of claim 2, wherein the photoluminescent molecule is 7-fluorobenz-2-oxa-1,3-diazole-4-sulfonamide:β-mercaptoethanol adduct.

14. A kit for assay of divalent metal ion concentration in a sample comprising:

i) an apo-carbonic anhydrase protein conjugated to a photoluminescent molecule selected from the group consisting of dansyl aziridine, 4-chloro-7-sulfobenzofuran, 7-flurorbenz-2-oxa-1,3-diazole-4-sulfonamide and nitrobenzoxadiazolyl;

ii) optionally a standard solution of at least one divalent metal ion;

iii) optionally a buffer for maintaining a concentration of free divalent metal ions in a solution; and

iv) optionally a chelating resin to prevent or remove unwanted metal contamination;

said items i), ii), iii) and iv) being packaged in a container that prevents unwanted contamination by divalent metal ions.

15. The kit of claim 14, wherein the buffer for maintaining a concentration of free divalent metal ions is nitrilotriacetic acid.

16. The kit of claim 14, wherein item ii) is included.

17. The kit of claim 13, wherein item iii) is included.

18. The kit of claim 13, wherein item iv) is included.

19. The kit of claim 13, wherein items ii) and iii) are included.

20. The kit of claim 13, wherein items ii) and iv) are included.

21. The kit of claim 13, wherein items ii), iii) and iv) are included.

22. The kit of claim 13, wherein items iii) and iv) are included.

23. A kit for assay of divalent metal ion concentration in a sample comprising:

i) an apo-carbonic anhydrase protein;

ii) a photoluminsecent molecule selected from the group consisting of 4-aminosulfonyl[1-(4-N-(5-fluoresceinylthioureido)butyl)benzamide, 7-fluorobenz-2-oxa-1,3-diazole-4-sulfonamide:2-mercaptoethanol adduct, dansylamide, hydroxynaphthalenesulphonamide, 2-(3-methoxy-4-ethoxyphenyl)-4-chloroquinoline-6-sulfonamide, N-(1-anthracenyl)-4-sulfonamido-benzenesulfonamide, 4-ethyl-1- 4-sulfonamidophenyl)-4-hydroxyquinoline-6-carboxylate and N-(N'-(4'-sulfamoylglutaranilyl-amidoethyl)-4-amino-3,6-disulfo-1,8-naphthalimide

iii) optionally a standard solution of a divalent metal ion;

iv) optionally a buffer for maintaining a concentration of free divalent metal ion in a solution; and

v) optionally a chelating resin to prevent or remove unwanted metal contamination;

said items i), ii), iii), iv) and v) being packaged in a container that prevents unwanted contamination by divalent metal ions.

24. The kit of claim 22, wherein the buffer for maintaining a concentration of free divalent metal ion is nitrilotriacetic acid or MOPS.